MIRROR LAKE

2019 SAMPLING HIGHLIGHTS

Station – 3 Deep Point

Tuftonboro and Wolfeboro, NH

Extension

Station 3 Deep Point (Figure 7) was used as a reference point to represent the overall Mirror Lake water quality. Water quality data displayed in Tables 1, 2 and 3 are surface water measurements with the exception of the Dissolved Oxygen data that were collected near the lake bottom.

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

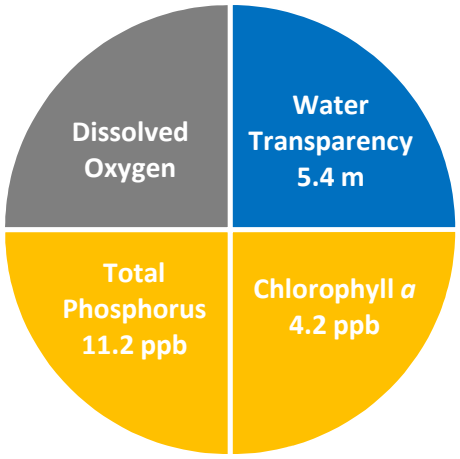


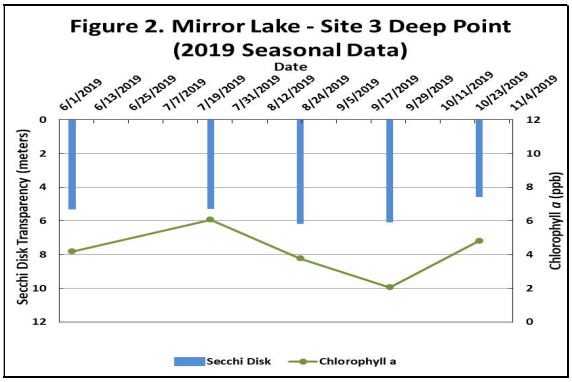
Figure 1. Mirror Lake Water Quality (2019)

Table 1. 2019 Mirror Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria[1]

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Mirror Lake Average (range)	Mirror Lake Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	**5.4** meters (4.5 – 6.1)	Oligotrophic
Chlorophyll *a* [1] (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	**4.2** ppb (2.0 – 6.1)	Mesotrophic
Total Phosphorus [1] (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	**11.2** ppb (9.4 – 13.7)	Mesotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	< 2.0	No Data	Not Assessed

Table 2. 2019 Mirror Lake Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Mirror Lake Average (range)	Mirror Lake Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**23.3** color units (range: 18.7 – 26.4)	Lightly tea colored
Alkalinity (mg/L)	< 0.0 acidified	0.1 – 2.0 extremely vulnerable	2.1 – 10 moderately vulnerable	10.1 – 25.0 low vulnerability	> 25.0 not vulnerable	**9.2** mg/L (range: 8.2 – 10.0)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			No Data	Not Assessed
Specific Conductivity (*u*S/cm)	< 50 *u*S/cm Characteristic of minimally impacted NH lakes		50-100 *u*S/cm Lakes with some human influence	> 100 *u*S/cm Characteristic of lakes experiencing human disturbances		No Data	Not Assessed



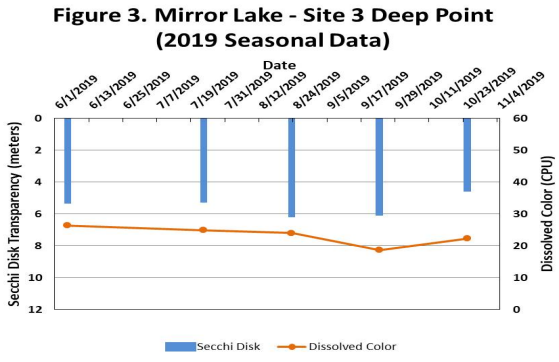


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations.

LONG-TERM TRENDS

WATER CLARITY: The Mirror Lake water clarity measurements, measured as Secchi Disk transparency, display a trend of increasing water clarity over a twenty-nine year span (Figure 4).

CHLOROPHYLL: The Mirror Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of increasing concentrations over a twenty-nine year span (Figure 4).

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The Mirror Lake total phosphorus concentrations have oscillated among years and display a relatively stable trend over twenty-nine years of water quality monitoring (Figure 5).

COLOR: The Mirror Lake color data, the result of naturally occurring "tea" color substances from the breakdown of soils and plant materials, display a trend of decreasing concentrations over a twenty-nine year span (Figure 5).

Figure 4. Mirror Lake - Site 3 Deep (1991-2019)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data

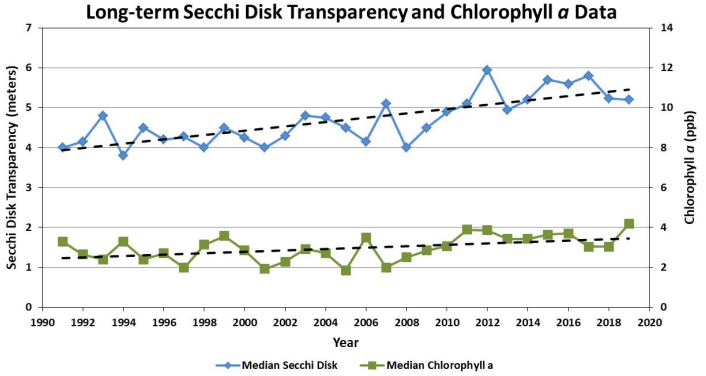


Figure 5. Mirror Lake - Site 3 Deep (1991-2019)
Long-term Total Phosphorus and Dissolved Color Data

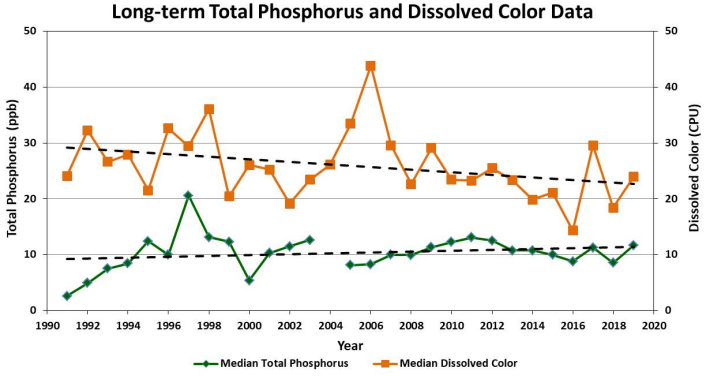


Table 3. Mirror Lake Near-shore Seasonal Average Water Quality Inter-Site Comparison (2019)

Near-shore Sampling Station	Average (range) Total Phosphorus (ppb)	Average (range) Chlorophyll *a* (ppb)	Average (range) Dissolved Color (CPU)
4 Hersey Cove	**9.8** ppb (range: 7.9 – 13.0)	**3.0** ppb (range: 2.0 – 3.5)	**22.7** CPU (range: 17.0 – 32.0)
5 Bowles Inlet	**8.4** ppb (range: 7.9 – 9.0)	**2.8** ppb (range: 2.0 – 3.4)	**23.8** CPU (range: 21.4 – 25.5)
7 Beach Inlet	**9.9** ppb (range: 8.4 – 12.7)	**2.9** ppb (range: 2.1 – 3.7)	**24.5** CPU (range: 21.3 – 27.4)
8 Libby Cove	**15.1** ppb (range: 9.1 – 36.2)	**3.1** ppb (range: 2.4 – 4.0)	**22.2** CPU (range: 17.9 – 28.5)
9 M.L. Drive	**8.5** ppb (range: 7.6 – 8.8)	**2.7** ppb (range: 1.8 – 3.2)	**22.7** CPU (range: 16.1 – 29.3)
10 109 Launch	**8.2** ppb (range: 7.2 – 9.6)	**2.7** ppb (range: 2.0 – 4.2)	**22.6** CPU (range: 17.9 – 27.6)

Figures 4 and 5. Changes in the Mirror Lake water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 1991 and 2019. **These data illustrate the relationship among plant growth, water color and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth.** Long-term trends are based on the analysis of annual median values.

Figure 6. Mirror Lake - Site 3 Deep Point

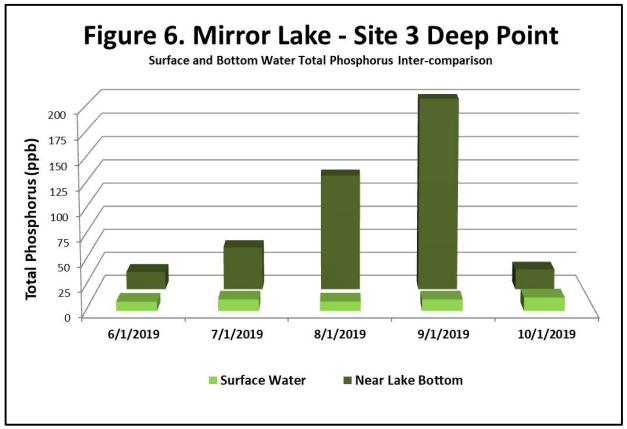


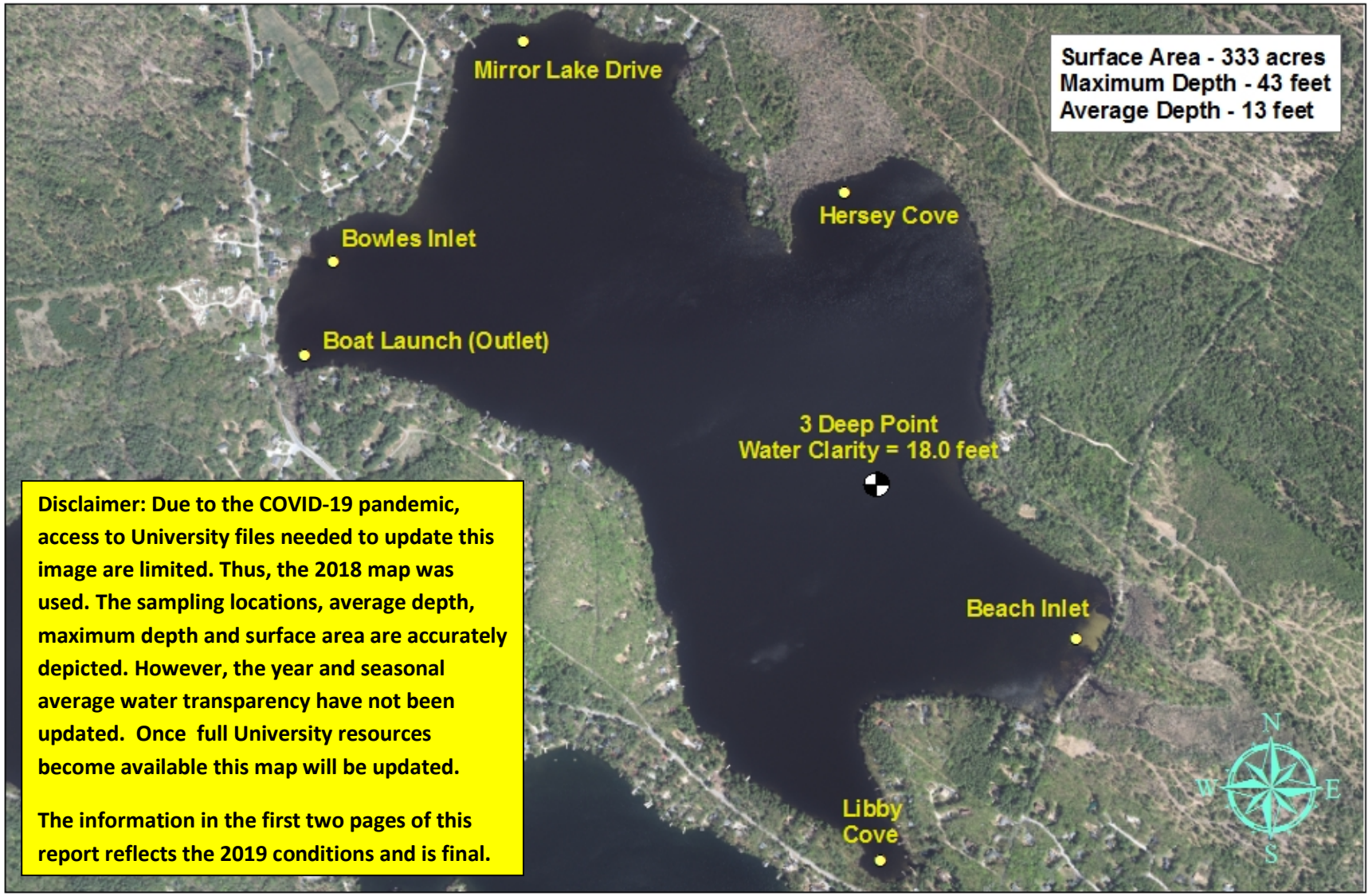
Figure 6. Monthly Mirror Lake surface water and bottom water total phosphorus inter-comparison. Notice the difference between the surface water and bottom water total phosphorus concentrations. The elevated deep water total phosphorus concentrations may be associated with the phenomenon known as internal nutrient loading that is typically associated with low dissolved oxygen concentrations near the lake bottom.

Recommendations

Implement Best Management Practices within the Mirror Lake watershed to minimize the adverse impacts of polluted runoff and erosion into Mirror Lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off. The Mirror Lake Watershed Management Plan, prepared by Geosyntec Consultants, lists additional measures that can help reduce the phosphorus inputs into Mirror Lake.

- https://des.nh.gov/organization/divisions/water/wmb/was/documents/mirror-lake-wmp-2012.pdf
- https://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- https://www.des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

Figure 7. Mirror Lake
Tuftonboro and Wolfeboro, NH
2018 Deep and nearshore sampling sites with seasonal average water clarity



Aerial Orthophoto Source: NH GRANIT
Site location GPS coordinates collected by the UNH Center for Freshwater Biology

NH Extension